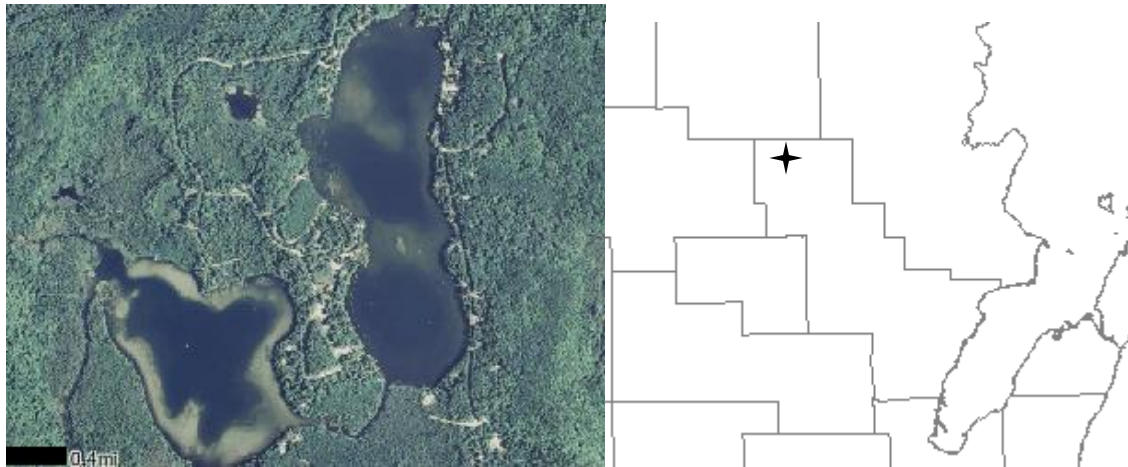


BEAR & MUNGER LAKES  
Oconto County  
2017 Fish Management Report

Christopher C. Long  
Fisheries Biologist



Wisconsin Department of Natural Resources  
101 N. Ogden Rd.  
Suite A  
Peshtigo, Wisconsin 54157



# Bear & Munger Lakes; Oconto County Wisconsin 2017 Fish Management Report

---

Christopher C. Long, Fisheries Biologist, Date

---

Michael C. Donofrio, Fisheries Supervisor, Date

---

David E. Boyarski, Eastern District Supervisor, Date

## SUMMARY

### Lake and location:

**Bear Lake**, Oconto County, T33N R16E Section 21

### Physical / chemical attributes (Carson et al. 1977):

Surface acres: 78

Maximum depth (ft): 16

Lake type: drainage lake

Basic water chemistry: slightly alkaline with high transparency.

Littoral substrate: 75% marl, 20% muck, with the balance sand, gravel, and rubble.

Aquatic vegetation: Submergent vegetation is moderate in density in parts of the lake basin.

Other features: Bear Lake has three inlets from unnamed spring ponds and the outlet flows to Munger Lake. Navigable water type public access is available from Munger Lake. The shoreline is 50% upland consisting of hardwoods and 50% wetland composed primarily of swamp conifer.

### Lake and location:

**Munger Lake**, Oconto County, T33N R16E Section 21

### Physical / chemical attributes (Carson et al. 1977):

Surface acres: 97

Maximum depth (ft): 21

Lake type: drainage lake

Basic water chemistry: slightly alkaline with high transparency.

Littoral substrate: 88% muck, 10% sand, and 2% boulders.

Other features: The Town of Lakewood provides public access without parking. The shoreline is 80% upland consisting of mixed hardwoods and conifers and 20% wetland of shrub bog.

### Purpose of survey:

Determine the status of the fishery.

### Surveys:

WDNR Survey ID: 515084059 – Fisheries assessments; Early spring WAE MUE;  
April 10 to April 20, 2017

WDNR Survey ID: 515084060 – Fisheries assessments; Early spring WAE MUE;  
April 20, 2017

WDNR Survey ID: 515084319 & 515084321 – Fisheries assessments; Late spring bass and panfish;  
June 13, 2017

### Fishery:

Rock bass, black crappie, and bluegill are abundant. Largemouth bass, yellow perch, and northern pike are common while walleye and muskellunge are present.

## EXECUTIVE SUMMARY

- Bear and Munger Lakes, located in northern Oconto County, have been managed as a single system for several decades because fish are able to move freely between lakes. Bear Lake is 78 acres and Munger Lake is 97 acres. A public boat ramp is located on the east side of Munger Lake. Bear Lake can be accessed via a navigable channel from Munger Lake.
- The Wisconsin DNR regularly stocked muskellunge between 1957 and 1979. A 1987 survey documented natural reproduction of muskellunge but densities were low. The muskellunge stocking program was discontinued because natural reproduction was occurring and because silver pike, a genetic variant of northern pike, was present in both lakes.
- Overall, 1,803 fish representing 10 species and 1 hybrid were collected during the 2017 sampling season (Table 4). The five most abundant species collected by number were rock bass (37%), bluegill (20%), largemouth bass (9%), hybrid sunfish (6%), and black crappie (6%).
- During the survey, 364 bluegill were collected (Table 4). Bluegill ranged in length from 1.9 to 8.8 inches and averaged 5.2 inches from the combined electrofishing and fyke netting samples. Overall, 32% of the bluegill measured were 6.0 in or greater and considered harvestable (Figure 4). Bluegill are reaching a harvestable size (6.0 inches) between ages 5 and 6 (Figure 5).
- One hundred sixty-three largemouth bass were collected and SEII electrofishing yielded a CPUE of 15.2/mi and fyke netting a CPUE of 0.7/NN (Tables 5 & 6). Bass ranged in length from 3.7 to 20.2 inches and averaged 11.3 inches (Figure 6). Twenty-seven percent of largemouth bass collected during the survey were over the 14-inch minimum length limit (Figure 6). Largemouth bass growth was below average beginning at age 6 compared to the average mean length at age for bass in northern Wisconsin (Figure 7).
- A total of 106 crappie were collected, mostly during the spring fyke netting. Crappie ranged in length from 5.0 to 12.4 inches and averaged 8.7 inches (Figure 8). A majority of black crappie aged (54%) were 6 years old and averaged 9.1 inches (Figure 9).
- A total of 79 pike was collected and ranged in length from 9.4 to 31.4 inches and averaged 20.2 inches (Figure 13). Only 5 pike over the minimum length limit of 26 inches were collected; however, the northern pike population is healthy in terms of abundance and size structure since numerous fish between 17 and 22 inches were collected (Figure 13).
- During the survey, a total of 37 walleye was collected during both electrofishing (1.1/mi in the spring; 1.3/mi in the summer) and fyke netting (0.3/NN). Only 5 recaptures were recorded during the survey (4 fyke netting; 1 electrofishing). Walleye ranged in length from 7.3 to 23.4 inches and averaged 17.2 inches (Figure 14). Walleye are reaching legal size (15 inches) by age 4 or 5 (Figure 15).
- In 2015, the minimum length limit for walleye was increased to 18 inches and the daily bag limit is 3 regardless of tribal harvest declarations. Therefore, alternate-year stockings of large fingerling walleye by the Munger Bear Lakes Management District (MBLMD) should continue at the rate of 10 fish/acre. The contribution of small fingerling walleye stocked by WDNR will be evaluated in 2018 and 2020.
- The current northern pike fishing regulation (26-inch minimum length limit; 2 fish daily bag), established in 1995, was implemented to protect silver pike. This regulation is intended to provide a quality pike fishing opportunity but is not accomplishing that goal. Therefore, we recommend removing this regulation and reverting to the statewide northern pike fishing regulation of no minimum length limit and a 5-fish daily bag.
- The next comprehensive fisheries survey is scheduled for 2025 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish.

## TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY .....	i
TABLE OF CONTENTS.....	ii
INTRODUCTION .....	1
METHODS .....	2
RESULTS .....	2
DISCUSSION .....	5
CONCLUSIONS & RECOMMENDATIONS.....	8
LITERATURE CITED .....	10
APPENDIX I – TABLES .....	11
APPENDIX II – FIGURES .....	16

## INTRODUCTION

Bear and Munger lakes are small drainage lakes located in northern Oconto County, Wisconsin. Bear Lake is 78 acres with a maximum depth of 16 feet (Figure 1). It has hard, slightly alkaline clear water which is extremely transparent. Most of the shoreline consists of upland mixed hardwoods and wetland swamp conifers. The littoral zone is 75% marl, 20% muck, with the remainder sand, gravel, and rubble.

Munger Lake is 97 acres with a maximum depth of 21 feet (Figure 2). Like Bear Lake, it has hard, slightly alkaline clear water. Eighty percent of the shoreline cover is a mixture of upland hardwoods and conifers while the remaining 20% is comprised of wetland shrub marsh. The littoral zone of Munger Lake is comprised of 88% muck, 10% sand, and 2% boulders.

A public boat ramp is located on the east side of Munger Lake. Bear Lake can be accessed via a navigable channel from Munger Lake and by foot across U.S. Forest Service and State property on the lake's western shoreline.

Bear and Munger Lakes have been managed as a single system for several decades because fish are able to move freely between lakes through a navigable channel. Between 1939 and 1951, these lakes were periodically stocked with northern pike and largemouth bass. The Wisconsin DNR regularly stocked muskellunge between 1957 and 1979. Surveys evaluating muskellunge stockings were conducted in 1970 and 1974 using electrofishing and fyke nets, respectively. A 1987 survey documented natural reproduction of muskellunge; but densities (fish / acre) were low in both lakes. The muskellunge stocking program was discontinued because natural reproduction was occurring and because silver pike, an extremely rare variant of northern pike, was present in both lakes. Three silver pike were collected during the 1987 survey.

Since the late 1990's, the Bear-Munger Lakes Management District has been stocking fish in both lakes (Table 1). Walleye has been the main focus of the stocking program although yellow perch, largemouth bass, and black crappie have also been stocked since 2003.

The last fisheries survey conducted on Bear and Munger Lakes was in 2009. This survey utilized spring fyke netting as well as spring, summer and fall electrofishing to characterize gamefish and panfish populations based on relative abundance, proportional stock density (PSD), relative stock density (RSD), catch per unit effort (CPUE), and mean length at capture (age). Population estimates were also generated for northern pike and walleye.

## METHODS

### Data collection:

Standard fyke nets (3-foot hoop, 3/4-bar, 1.5-inch stretch), mini-fyke nets (1/4-inch stretch with turtle exclusion) and a standard WDNR electrofishing boat were used to collect fish throughout the year. Sampling gear, effort, date, and target species for the survey are listed in Table 2. All gamefish fish collected were measured to the nearest 0.1-inch total length (TL). Not all panfish were measured; representative samples were taken to reduce handling mortality from a net or electrofishing run when the sample size was large. A sub-sample of scales or dorsal spines was collected for age and growth analysis from gamefish and panfish. Aging structures (scales or spines) were collected from 5 fish per half inch group that were not young-of-the-year (YOY). If sex could be determined, structures from 5 fish per sex were collected per half inch group. Ages were assigned to each fish using standard WDNR procedures.

### Data analysis:

Catch per unit effort (CPUE) was calculated as catch by gear divided by sampling effort for each species collected. Length frequency distributions were tabulated for dominant gamefish and consisted of combined April and June electrofishing samples as well as fyke net data. Proportional stock density (PSD) and relative stock density for preferred length fish ( $RSD^P$ ) were calculated for dominant gamefish (Table 3; Anderson and Neumann 1996). Preferred lengths of various gamefish have a minimum length between 45 and 55% of the world record length for that species (Anderson and Neumann 1996). Stock, quality, and preferred lengths were used as proposed by Gabelhouse (1984). PSD and  $RSD^P$  ranges for balanced populations of gamefish and panfish are listed in Table 3. Mean length at capture data was calculated for dominant gamefish and compared to the average of mean length at age for northern Wisconsin.

Population estimates for walleye and northern pike were not calculated during the spring fyke net survey since the number of fish sampled (and subsequent recaptures) was low.

## RESULTS

Overall, 1,803 fish representing 10 species and 1 hybrid were collected during the 2017 sampling season (Table 4). The five most abundant species collected by number were rock bass (37%), bluegill (20%), largemouth bass (9%), hybrid sunfish (6%), and black crappie (6%).

A total of 670 rock bass was collected which accounted for 37% of our sample (Table 4). Most rock bass were measured (571) and ranged in length from 3.0 to 10.5 inches and averaged

6.2 inches from the combined electrofishing and fyke netting samples (Figure 3). Six hundred thirty-three rock bass were collected during the spring fyke netting (CPUE = 6.7/NN) and 37 during the SEII electrofishing survey (CPUE = 37.0/mi) (Tables 5 & 6). Scales were not collected for age and growth analysis of rock bass however; the length frequency suggests that reproduction and recruitment is stable (Figure 3).

During the survey, 364 bluegill were collected (Table 4). Electrofishing yielded a CPUE of 101.0/mi and 2.8/NN during spring fyke (Tables 5 & 6). Bluegill ranged in length from 1.9 to 8.8 inches and averaged 5.2 inches from the combined electrofishing and fyke netting samples (Figure 4). Overall, 32% of the bluegill measured were 6.0 in or greater and considered harvestable (Figure 4). Bluegill PSD was 27 and  $RSD^P$  was 0; these values are from the June, SEII electrofishing sample. While PSD was within the desirable range for a balanced population,  $RSD^P$  was not (Table 3). A subsample of 44 bluegill was aged from 2 to 9 years old. Bluegill are reaching a harvestable size (6.0 inches) between ages 5 and 6 (Figure 5). Growth was average at all ages compared to the mean length at age of bluegill in northern Wisconsin (Figure 5).

One hundred sixty-three largemouth bass were collected during the 2017 fisheries survey and accounted for 9% of the fish collected (Table 4). SEII electrofishing yielded a CPUE of 15.2/mi and fyke netting a CPUE of 0.7/NN (Tables 5 & 6). Bass ranged in length from 3.7 to 20.2 inches and averaged 11.3 inches (Figure 6). Largemouth bass PSD was 83 and  $RSD^P$  was 28 (from the SEII electrofishing sample). While bass PSD was above the desirable range for a balanced population,  $RSD^P$  was within the preferred range (Table 3). Twenty-seven percent of largemouth bass collected during the survey were over the 14-inch minimum length limit (Figure 6). A subsample of 85 largemouth bass was aged from 2 to 16 years old. Largemouth bass growth was below average beginning at age 6 compared to the average mean length at age for bass in northern Wisconsin (Figure 7). Bass are reaching legal size (14 inches) between ages 7 and 9 (Figure 7). Successful reproduction and recruitment of largemouth bass were evident judging from the length frequency and age at length (Figures 6 & 7).

Black crappie comprised 6% of the fish collected (Table 4). A total of 106 crappie were collected, mostly during the spring fyke netting. Black crappie were collected fyke netting at a rate of 1.1/NN and via electrofishing at a rate of 6.0/mi (Tables 5 & 6). Crappie ranged in length from 5.0 to 12.4 inches and averaged 8.7 inches (Figure 8). Black crappie PSD 65 was and  $RSD^P$  was 25. A subsample of 54 crappie was aged from 4 to 12 years old. A majority of black



crappie aged (54%) were 6 years old and averaged 9.1 inches and only 3 crappie were 7 years old or older (Figure 9). The growth of black crappie was below average at ages 4 and 5 and closer to average at age 6 and older compared to other lakes in northern Wisconsin (Figure 9).

Pumpkinseed made up 5% of the fish collected (Table 4). Electrofishing produced a pumpkinseed CPUE of 17.0/mi and a fyke net CPUE of 0.9/NN. Pumpkinseed ranged in length from 3.9 to 8.5 inches and averaged 5.5 inches (Figure 10). Scales were not collected for age and growth analysis of rock bass however; the length frequency suggests that reproduction and recruitment is stable.

A total of 94 yellow perch was collected during the 2017 survey and ranged in length from 4.1 to 11.3 inches and averaged 6.6 inches (Figure 11). Sixty-one perch were collected during the spring fyke netting (CPUE = 0.6/NN; Table 5). Thirty-three yellow perch were collected during the summer, SEII electrofishing survey (CPUE = 33.0/mi; Table 6). Anal spines were collected from a subsample of 43 perch for age and growth analysis. Yellow perch averaged 7.1 inches at both ages 5 and 6 and made up a majority of the sample aged (Figure 12). Perch growth was average at most ages compared to other lakes in northern Wisconsin (Figure 12).

Eighty-seven yellow bullhead were collected accounted for 12% of the fish collected (Table 4). Yellow bullhead ranged in length from 6.7 to 13.7 in and averaged 10.6 inches.

Northern pike accounted for only 4% of the fish collected in 2017. A total of 79 pike was collected and ranged in length from 9.4 to 31.4 inches and averaged 20.2 inches (Figure 13). Northern pike electrofishing CPUE in was 0.8/mi (SEI) and 0.5/mi (SEII); fyke netting CPUE was 0.9/NN (Tables 5 & 6). Pike PSD was 49 and  $RSD^P$  was 1. Only 5 pike over the minimum length limit of 26 inches were collected however, the northern pike population is healthy in terms of abundance and size structure since numerous fish between 17 and 22 inches were collected (Figure 13). Due to the low number of recaptures, a population estimate was not calculated.

During the survey, a total of 37 walleye was collected during both electrofishing (1.1/mi - SEI; 1.3/mi - SEII) and fyke netting (0.3/NN) (Tables 5 & 6). Only 5 recaptures were recorded during the survey (4 fyke netting; 1 SEI electrofishing). Walleye ranged in length from 7.3 to 23.4 inches and averaged 17.2 inches (Figure 14). Walleye PSD was 93 and  $RSD^P$  was 15. Walleye PSD was higher than the desirable range of 30 to 60 (Table 1). A subsample of 31 walleye was aged from 1 to 10 years old. Walleye are reaching legal size (15 inches) by age 4 or 5 (Figure 15). Age-5 walleye averaged 16.4 inches and accounted for 35% of the walleye aged

(Figure 15). Compared to the average mean length at age for northern Wisconsin, walleye growth is about average at all ages (Figure 15). Due to the low number of recaptures, a population estimate was not calculated.

Two muskellunge were collected during the spring fyke netting (42.6 and 43.4 inches). Muskellunge stockings were discontinued in 1979 because of the presence of silver pike in Bear and Munger Lakes. The muskellunge population is being maintained by natural reproduction.

## DISCUSSION

Bear and Munger Lakes are relatively infertile due to their small upland, forested watershed. Populations of panfish (blugill, black crappie, yellow perch, and rock bass) and gamefish (largemouth bass, northern pike, and walleye) are present and offer anglers a respectable fishing opportunity.

The total number of fish collected in the 2017 fisheries survey of Bear and Munger Lakes was less than half of what was collected in 2009 (Table 8). While the timing of spring fyke netting was similar between years, the amount of sampling effort was different. For example, in 2009 spring fyke netting totaled 126 NN of effort whereas in 2017, fyke netting accounted for only 95 NN of effort. On the other hand, SEII (gamefish / panfish electrofishing) was conducted in May 2009 versus June 2017 but sampling effort (time and distance) was the same between years. The difference in timing (May vs. June) could have impacted our results, especially panfish. Lastly, largemouth bass were collected during the spring (SEI) and fall electrofishing surveys conducted in 2009. Largemouth bass were not collected during the SEI electrofishing in 2017 and no fall electrofishing was conducted. Therefore, some of changes observed between surveys can be attributed to the timing of the survey and what was collected however, the differences in abundance and catch rates between surveys is not alarming since the decline was consistent across all fish species (Table 8).

Rock bass was the most abundant species collected in both the 2009 and 2017 fisheries surveys (Table 8). SEII CPUE of rock bass doubled between 2009 and 2017 from 15.0/mi to 37.0/mi, respectively (Table 5). However, spring fyke netting CPUE was similar between years and the average length of rock bass collected during both surveys was 6.2 inches (Table 5). Therefore, it is safe to assume that rock bass abundance and size structure is stable and has not changed between 2009 and 2017.

The total number of bluegill collected declined between the 2009 and 2017 surveys (Table 8). Spring fyke netting CPUE declined from 4.6 bluegill/NN in 2009 to 2.8/NN in 2017 but SEII electrofishing CPUE increased from 35.0/mi in 2009 to 101.0/mi in 2017 (Tables 5 & 6). However, the average length of bluegill collected in 2017 was 5.2 inches compared to 5.1 in 2009 and bluegill PSD and  $RSD^P$  were relatively the same between surveys: 2017; PSD = 27,  $RSD^P$  = 0 / 2009; PSD = 28,  $RSD^P$  = 1. Therefore, despite the lower total number of bluegill collected in 2017, size structure indices (i.e. PSD &  $RSD$ ) did not change and suggest the bluegill population is balanced in terms of size structure. Additionally, growth was similar between survey years and average compared to other lakes in northern Wisconsin (Figure 5).

Largemouth bass abundance appears to have declined slightly between 2009 and 2017 but size structure has improved (Figure 16). Electrofishing CPUE decreased from 43.9/mi in 2009 to 15.2/mi in 2017 (Table 6). However, PSD and  $RSD^P$  both improved between years. In 2009, largemouth bass PSD was 35 and  $RSD^P$  was 5 whereas in 2017, bass PSD was 83 and  $RSD^P$  was 28. Even though PSD is a little high,  $RSD^P$  is within the desirable range (Table 3). Largemouth bass PSD and  $RSD^P$  have been influenced by strong year classes in both 2009 and 2017. In 2009, a strong year class of age-4 bass averaging 10.0 in contributed to the low PSD but in 2017, the lack of largemouth bass collected between 8 inches (stock size) and 12 inches (quality size) was reduced, thereby inflating PSD. The proportion of largemouth bass over the 14-inch minimum length increased between 2009 and 2017 from 21 to 27%, respectively. Largemouth bass growth was similar between survey years but still below average compared to other lakes in northern Wisconsin (Figure 7). The slower growth observed in larger/older largemouth bass could be attributed to our ability to accurately assess ages of older fish using dorsal spines and the small sample size of larger/older bass. Nonetheless, the length frequency of largemouth bass demonstrated good reproduction and recruitment but growth was slightly below average and showed little change since 2009 (Figures 6 & 7). Bass fishing on Bear and Munger Lakes should continue to provide the same consistent opportunity that it has in previous years.

Crappie are cyclic spawners meaning that successful reproduction and recruitment can be highly variable and unpredictable from year to year. The relative abundance of black crappie declined between 2009 and 2017 from 16% to 6%, respectively and spring fyke netting CPUE declined from 4.6 crappie/NN in 2009 to 1.1/NN in 2017 (Tables 5 & 8). However, the average length of crappie collected increased from 6.4 to 8.7 inches between 2009 and 2017 (Table 7).

The 2009 survey revealed a strong year class of age-3 crappie (5.0 inches) which corresponded to a stocking event in 2008 (Table 1; Figure 8). This large year class has cycled through the population. Age and growth analysis from the 2017 survey suggests that there is a large age-6 year class ranging in length from 6.5 to 11.0 inches. It is probable that there is some margin of error associated with aging these fish especially since crappie growth was slightly below average (Figure 9). Regardless, black crappie have historically demonstrated good survival after stocking, successful reproduction and sufficient recruitment in Bear and Munger Lakes. Stocking of black crappie may be a viable option for stocking by the MBLMD if desired. Based on this information, anglers should expect crappie fishing to remain stable over the next several years.

Yellow perch were the least abundant panfish species collected in both 2009 and 2017 (Table 8). Fyke netting CPUE declined from 1.1 perch/NN in 2009 to 0.6/NN in 2017 (Table 5). Also, SEII electrofishing CPUE declined from 106.0/mi to 33.0/mi between surveys (Table 6). Even though the average length of yellow perch increased from 6.2 to 6.6 inches between surveys, the number and size of perch collected in each survey varied considerably (Figure 11). For example, in 2009 the majority of perch collected were age 3 and age 4 while in 2017, most perch were age 5 and age 6. The difference in mean length at age between 2009 and 2017 is significant at ages 5 and 6 (Figure 12). In 2017, both age-5 and age-6 perch averaged 7.1 inches but in 2009, age-5 perch averaged 8.9 inches and age-6 perch averaged 9.1 inches (Figure 11). Male and female perch each exhibit different growth rates and should be analyzed independently. Since our aging structures (anal spines) for both male and female perch were combined to calculate mean length at age/capture, our results may be affecting our age and growth analysis because of the number of male and females aged from each survey (2009 vs. 2017).

The length frequency of northern pike (Figure 13) might suggest that once a fish reaches 26 inches, then harvest of pike occurs. Northern pike are currently managed with a 2 fish / day and 26-inch minimum size limit (Table 7). This regulation was established to protect “silver pike”, a genetic variant of northern pike. No silver pike were collected during the 2009 or 2017 fisheries surveys. Even though no population estimate for northern pike was calculated in 2017, the 2009 population estimate for pike revealed a density of approximately 6.0 fish per acre which is above average compared to other lakes in northern Wisconsin (Pierce et al. 2003). Spring fyke netting CPUE declined from 1.4 pike/NN in 2009 to 0.9/NN in 2017 (Table 5) but this decline could be a result of reduced fyke net sampling effort. Reduced abundance across all length

groups was evident in 2017 (Figure 13). Northern pike size structure (PSD / RSD<sup>P</sup>) and spring fyke netting CPUE was similar between 2009 and 2017. In 2009, pike PSD was 47 and RSD<sup>P</sup> was 2 whereas in 2017, northern pike PSD was 49 and RSD<sup>P</sup> was 1. The northern pike population remains healthy with numerous fish between 17 and 24 inches, but few fish over the minimum length limit of 26 in were collected in both 2009 and 2017 (Figure 13).

Walleye were the least abundant gamefish collected during the 2017 fisheries survey (Table 5). Adult walleye density in Bear and Munger Lakes was 1.2/acre in 2009 but due to the low number of recaptures during the 2017 survey, a population estimate could not be calculated. Spring fyke netting and spring electrofishing CPUE's were nearly identical between the 2009 and 2017 surveys (Tables 5 & 6).

The walleye fishery in Bear and Munger Lakes is supported entirely by stocking; natural reproduction has not been documented. Prior to 2009, the stocking rate of large fingerling walleye was inconsistent and inadequate to support a quality walleye fishing opportunity. A more consistent stocking schedule was implemented in 2010 whereby large fingerling walleye were stocked at a much higher rate (Table 1). In 2016, WDNR stocked 5,736 small fingerling walleye for the first time in Bear and Munger Lakes (Table 1). Therefore, the Munger Bear Lakes Management District (MBLMD) agreed to only stock large fingerling walleye in alternate years at the rate of 10 per acre (1,750 total). This stocking strategy/schedule should create a more balanced walleye population in terms of size and age structure, promote a better fishing opportunity for walleye, and aid in evaluating the contribution/survival of small fingerling walleye. Unfortunately, no fall electrofishing was conducted in 2016 to evaluate the stocking of small fingerling walleye and only 1 fish from the 2016 stocking was collected in 2017 (Figures 14 & 15).

Only 2 muskellunge were collected during the 2017 survey compared to 7 in 2009 (Table 8). Muskellunge stockings were discontinued in 1979 because of the presence of silver pike in Bear and Munger Lakes. The remnant muskellunge population is being maintained by natural reproduction.

## CONCLUSIONS & RECOMMENDATIONS

The 2017 fisheries survey of Bear and Munger Lakes indicated fair numbers of both gamefish and panfish species. Most species showed good size and age structure and decent recruitment.

New walleye fishing regulations were implemented in 2015. The previous regulation consisted of a 15-inch minimum length limit but the daily bag limit fluctuated based on tribal harvest declarations. In 2015, the minimum length limit was increased to 18 inches and the daily bag limit is 3 regardless of tribal harvest declarations. Therefore, alternate-year stockings of large fingerling walleye by the MBLMD should continue at the rate of 10 fish/acre. The contribution of small fingerling walleye stocked by WDNR will be evaluated through fall electrofishing surveys in 2018 and 2020. However, if fall electrofishing fails to produce at least 5 YOY/mile, these stockings will be discontinued.

The current northern pike fishing regulation (26-inch minimum length limit; 2 fish daily bag), established in 1995, is intended to provide a quality pike fishing opportunity. However, this regulation was implemented to protect silver pike and is currently not well aligned with the statewide northern pike management plan. Since silver pike were not collected in either Bear or Munger Lake during the last two fisheries surveys, and silver pike are more prevalent throughout Wisconsin than previously thought, we recommend removing this regulation and reverting to the statewide northern pike fishing regulation of no minimum length limit and a 5-fish daily bag. This regulation change will likely result in greater pike harvest by anglers however, size structure may improve over time as smaller pike are removed from the population.

Bluegill and rock bass populations are being sustained by natural reproduction and will continue to provide a stable fishing opportunity for anglers. Yellow perch and black crappie have been stocked by the MBLMD. Our surveys revealed good survival of those stocked fish (perch in 2003-2004 and crappie in 2008). However, natural reproduction and recruitment of both species is evident. Future stocking of yellow perch and/or black crappie by the MBLMD may be a practical option since WDNR does not produce these species at their hatcheries.

Fishing regulations for panfish species, largemouth bass and walleye in Bear and Munger Lakes are adequate to provide quality fishing for anglers (Table 7). Anglers fishing at Bear and Munger Lakes should have success targeting panfish (rock bass, bluegill, crappie, pumpkinseed, and yellow perch) and gamefish (largemouth bass and northern pike). The number of adult walleye remains low but should improve if the current stocking schedule and stocking rate of large fingerlings by the MBLMD are maintained.

The next comprehensive fisheries survey (spring fyke netting, spring SEI electrofishing, summer SEII electrofishing, and fall electrofishing) of Bear and Munger Lakes is scheduled for 2025 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish.

Access to Munger Lakes is available from the boat landing on Lake John Road but parking is only available along the road. Bear Lake is accessed via a navigable channel from Munger Lake. The only shore fishing opportunity available on Munger Lake is at the boat landing and only a small portion of the Bear Lake shoreline is owned by the United States Forest Service making shore-fishing opportunities limited at both locations. Boaters are reminded to remove all vegetation from their boat and trailer before leaving to limit the spread of invasive species. Maps of Bear and Munger Lakes can be found at the following links;

<http://dnr.wi.gov/lakes/maps/DNR/0471200a.pdf> ; <http://dnr.wi.gov/lakes/maps/DNR/0470900a.pdf>

#### LITERATURE CITED

- Anderson, R. O. and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-481 *in* B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- Bister, T.J., D.W. Willis, M.L. Brown, S.M. Jordan, R.M. Neumann, M.C. Quist, and C.S. Guy. 2000. Proposed standard weight (Ws) equations and standard length categories for 18 warmwater nongame and riverine fish species. North American Journal of Fisheries Management 20:570-574.
- Gabelhouse, D.W. Jr. 1984. A length-categorization system to assess fish stocks. North American Journal of Fisheries Management 4: 273-285.
- Pierce, R.B., C.M. Tomcko, and T.L. Margenau. 2003. Density dependence in growth and size structure of northern pike populations. North American Journal of Fisheries Management. 23:331-339.
- Willis, D.W., B.R. Murphy, and C.S. Guy. 1993. Stock density indices: development, use, and limitations. Reviews in Fisheries Science 1:203-222.

## APPENDIX I – TABLES



Table 1. Fish stocking history for Bear and Munger Lakes; Oconto County, WI.

Waterbody Name	Year	Species	Age Class	Number Stocked	Avg Length (inches)	Source Type
BEAR & MUNGER	2008	BLACK CRAPPIE	SMALL FINGERLING	750	5.0	PRIVATE HATCHERY
BEAR & MUNGER	1992	LARGEMOUTH BASS	YEARLING	280	9.0	PRIVATE HATCHERY
BEAR & MUNGER	1994	LARGEMOUTH BASS	FINGERLING	3350	1.9	DNR COOP PONDS
BEAR & MUNGER	1995	LARGEMOUTH BASS	FINGERLING	1000	3.9	DNR COOP PONDS
BEAR & MUNGER	1996	LARGEMOUTH BASS	LARGE FINGERLING	1200	5.0	PRIVATE HATCHERY
BEAR & MUNGER	2003	LARGEMOUTH BASS	SMALL FINGERLING	2500	2.2	DNR PONDS
BEAR & MUNGER	1972	MUSKELLUNGE	FINGERLING	300	13.0	DNR COOP PONDS
BEAR & MUNGER	1973	MUSKELLUNGE	FINGERLING	300	9.0	DNR COOP PONDS
BEAR & MUNGER	1974	MUSKELLUNGE	FINGERLING	300	9.0	DNR COOP PONDS
BEAR & MUNGER	1976	MUSKELLUNGE	FINGERLING	200	13.0	DNR COOP PONDS
BEAR & MUNGER	1977	MUSKELLUNGE	FINGERLING	200	9.0	DNR COOP PONDS
BEAR & MUNGER	1978	MUSKELLUNGE	FINGERLING	200	8.0	DNR COOP PONDS
BEAR & MUNGER	1979	MUSKELLUNGE	FINGERLING	200	8.0	DNR COOP PONDS
BEAR & MUNGER	2003	WALLEYE	LARGE FINGERLING	476	5.0	PRIVATE HATCHERY
BEAR & MUNGER	2004	WALLEYE	LARGE FINGERLING	600	-	PRIVATE HATCHERY
BEAR & MUNGER	2005	WALLEYE	LARGE FINGERLING	500	-	PRIVATE HATCHERY
BEAR & MUNGER	2006	WALLEYE	LARGE FINGERLING	500	6.8	PRIVATE HATCHERY
BEAR & MUNGER	2007	WALLEYE	LARGE FINGERLING	470	7.5	PRIVATE HATCHERY
BEAR & MUNGER	2008	WALLEYE	LARGE FINGERLING	313	7.0	PRIVATE HATCHERY
BEAR & MUNGER	2010	WALLEYE	LARGE FINGERLING	2630	9.0	PRIVATE HATCHERY
BEAR & MUNGER	2012	WALLEYE	LARGE FINGERLING	1797	7.0	PRIVATE HATCHERY
BEAR & MUNGER	2013	WALLEYE	LARGE FINGERLING	1640	8.0	PRIVATE HATCHERY
BEAR & MUNGER	2014	WALLEYE	LARGE FINGERLING	1647	6.0	PRIVATE HATCHERY
BEAR & MUNGER	2015	WALLEYE	LARGE FINGERLING	1640	8.0	PRIVATE HATCHERY
BEAR & MUNGER	2016	WALLEYE	SMALL FINGERLING	5739	2.0	DNR HATCHERY
BEAR & MUNGER	2017	WALLEYE	LARGE FINGERLING	2610	8.0	PRIVATE HATCHERY
BEAR & MUNGER	1997	YELLOW PERCH	LARGE FINGERLING	1200	4.0	PRIVATE HATCHERY
BEAR & MUNGER	1998	YELLOW PERCH	LARGE FINGERLING	1575	-	PRIVATE HATCHERY
BEAR & MUNGER	2003	YELLOW PERCH	LARGE FINGERLING	625	4.7	PRIVATE HATCHERY
BEAR & MUNGER	2004	YELLOW PERCH	UNKNOWN	625	-	PRIVATE HATCHERY

Table 2. Sampling gear, date, target species, sampling effort, and location (distance) for 2017 fisheries survey on Bear and Munger Lakes; Oconto County, WI.

Gear	Date	Target Species	Sampling Effort hours (h) or net night (NN)	Shoreline Distance (mi)
Fyke net	April 10, 2017	All fish	95 NN	
	to			
	April 20, 2017			
Electrofishing	April 20, 2017	Gamefish	1.8 h	3.8
Electrofishing	June 13, 2017	Gamefish	1.8 h	3.8
		&		
		Panfish	0.6 h	1.0

Table 3. Proposed length categories for various fish species. Measurements are total lengths for each category in inches. Updated from Anderson and Neumann (1996) and Bister et al. (2000).

Species	PSD	RSD-P	Stock	Quality	Preferred	Memorable	Trophy
Black crappie			5	8	10	12	15
Bluegill	20 - 60	5 - 20*	3	6	8	10	12
Brown bullhead			5	8	11	14	17
Largemouth bass	40 - 70	10 - 40*	8	12	15	20	25
Muskellunge			20	30	38	42	50
Northern pike	30 - 60		14	21	28	34	44
Pumpkinseed			3	6	8	10	12
Rock bass	20 - 60		4	7	9	11	13
Walleye	30 - 60		10	15	20	25	30
Yellow perch			5	8	10	12	15
Yellow bullhead			4	7	9	11	14

\*Range based on management strategy for balanced populations.

Table 4. Relative abundance and length range of fishes collected in 2017 on Bear and Munger Lakes; Oconto County, WI. 2009.

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER			
*Common Name of Fish	Number	Percent	Length Range (inches)
Rock bass	670	37.2%	3.0 - 10.5
Bluegill	364	20.2%	1.9 - 8.8
Largemouth bass	163	9.1%	3.7 - 20.2
Hybrid sunfish	108	6.0%	3.9 - 8.6
Black crappie	106	5.9%	5.0 - 12.4
Pumpkinseed	98	5.4%	3.9 - 8.5
Yellow perch	94	5.2%	4.1 - 11.3
Yellow bullhead	87	4.8%	6.7 - 13.7
Northern pike	79	4.4%	9.4 - 31.4
Walleye	32	1.8%	7.3 - 23.4
Muskellunge	2	0.1%	42.6 - 43.4
TOTAL	1,803		

\* Common names of fishes recognized by the American Fisheries Society.

Table 5. Comparison of spring fyke netting data from Bear and Munger Lakes; Oconto County, WI.

2017 Fyke Netting (95*)			2009 Fyke Netting (126*)		
Species	Total Catch	Mean Catch per net night	Species	Total Catch	Mean Catch per net night
Rock bass	633	6.7	Rock bass	791	6.3
Bluegill	263	2.8	Black crappie	618	4.9
Black crappie	103	1.1	Bluegill	582	4.6
Hybrid sunfish	100	1.1	Yellow bullhead	468	3.7
Northern pike**	86	0.9	Pumpkinseed	333	2.6
Pumpkinseed	81	0.9	Largemouth bass**	193	1.5
Yellow bullhead	78	0.8	Northern pike**	173	1.4
Largemouth bass	69	0.7	Yellow perch	143	1.1
Yellow perch	61	0.6	Hybrid sunfish	128	1.1
Walleye**	28	0.3	Walleye**	46	0.4
Muskellunge	2	< 0.01	Golden shiner	25	0.2
			Muskellunge	5	< 0.01
			Brown bullhead	2	< 0.01
TOTAL	1,504		TOTAL	3,507	

\*Sampling effort in net nights for each corresponding year.

\*\*Includes recaptured fish.

Table 6. Seasonal electrofishing summary from Bear and Munger Lakes; Oconto County, WI.

Species	Spring electrofishing (SEI)						Gamefish/Panfish electrofishing (SEII)					
	2017 April			2009 April			2017 June			2009 May		
	Total Catch	CPUE /hour	CPUE /mile	Total Catch	CPUE /hour	CPUE /mile	Total Catch	CPUE /hour	CPUE /mile	Total Catch	CPUE /hour	CPUE /mile
Bluegill							101	202.0	101.0	35	51.2	35.0
Largemouth bass	37	20.8	9.7				57	32.8	15.2	171	73.8	43.9
Rock bass							37	74.0	37.0	15	22.0	15.0
Yellow perch							33	66.0	33.0	106	155.1	106.0
Pumpkinseed							17	34.0	17.0	20	29.3	20.0
Walleye	4	2.2	1.1	6	2.3	1.3	5	2.9	1.3	14	6.0	3.6
Black crappie							3	12.0	6.0	3	4.4	3
Northern pike	3	1.7	0.8	15	5.6	3.3	2	1.1	0.5	13	5.6	3.3
Muskellunge				1	0.2	1.0						

Table 7. Fishing regulations for the 2017-2018 fishing season on Bear and Munger Lakes; Oconto County, WI.

Species	Fishing Season	Daily Limit	Minimum Length
Largemouth bass	May 6 - March 4	5	14 inches
Northern pike	May 6 - March 4	5	None
Walleye	May 6 - March 4	3	18 inches
Muskellunge	May 27 - November 30	1	40 inches
Panfish (bluegill, pumpkinseed, crappie, and yellow perch)	Open all year	25 in total	None
Bullheads	Open all year	None	None
Rock bass	Open all year	None	None

Table 8. Relative abundance comparison between 2009 and 2017 fisheries surveys on Bear and Munger Lakes; Oconto County, WI.

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER							
2017				2009			
*Common Name of Fish	Number	Percent	Length Range (inches)	*Common Name of Fish	Number	Percent	Length Range (inches)
Rock bass	670	37.2%	3.0 - 10.5	Rock bass	806	20.1%	3.8 - 9.7
Bluegill	364	20.2%	1.9 - 8.8	Black crappie	621	15.5%	3.6 - 12.9
Largemouth bass	163	9.1%	3.7 - 20.2	Bluegill	617	15.4%	2.6 - 10.2
Hybrid sunfish	108	6.0%	3.9 - 8.6	Yellow bullhead	475	11.8%	5.8 - 13.7
Black crappie	106	5.9%	5.0 - 12.4	Largemouth bass	428	10.6%	2.5 - 20.9
Pumpkinseed	98	5.4%	3.9 - 8.5	Pumpkinseed	353	8.8%	3.2 - 8.2
Yellow perch	94	5.2%	4.1 - 11.3	Yellow perch	249	6.2%	2.9 - 10.4
Yellow bullhead	87	4.8%	6.7 - 13.7	Northern pike	216	5.4%	8.6 - 29.8
Northern pike	79	4.4%	9.4 - 31.4	Hybrid sunfish	149	3.7%	3.5 - 8.7
Walleye	32	1.8%	7.3 - 23.4	Walleye	69	1.7%	6.6 - 25.3
Muskellunge	2	0.1%	42.6 - 43.4	Golden shiner	27	0.7%	not measured
				Muskellunge	7	0.2%	39.0 - 47.5
				Brown bullhead	2	< 0.1%	not measured
TOTAL	1,803			TOTAL	4,019		

\* Common names of fishes recognized by the American Fisheries Society.

## APPENDIX II – FIGURES

LAKE BEAR  
SECTION 21-28  
TOWNSHIP 33 N  
RANGE 16 E  
TOWNSHIP WHEELER  
COUNTY OGEMO

Sec. 21  
Sec. 28

Length of Shore Line 17 Mi.

4.5 ft. to 10 ft. 20 ft. Depth

LAKE IMPROVEMENT RECORD				
TYPE	DATE			
#BRUSH REFUGES				
#SAPLING TANGLES				
#SPAWNING BOXES				
#MINNOW SPINNERS				
TOTAL				

LEGEND

- W NEED BEDS
- C ROCKY SHOALS
- S SAND
- CL CLAY
- G GRAVEL
- A MUCK
- DWELLING
- ABANDONED DWELLING
- RESORT

add addend

17

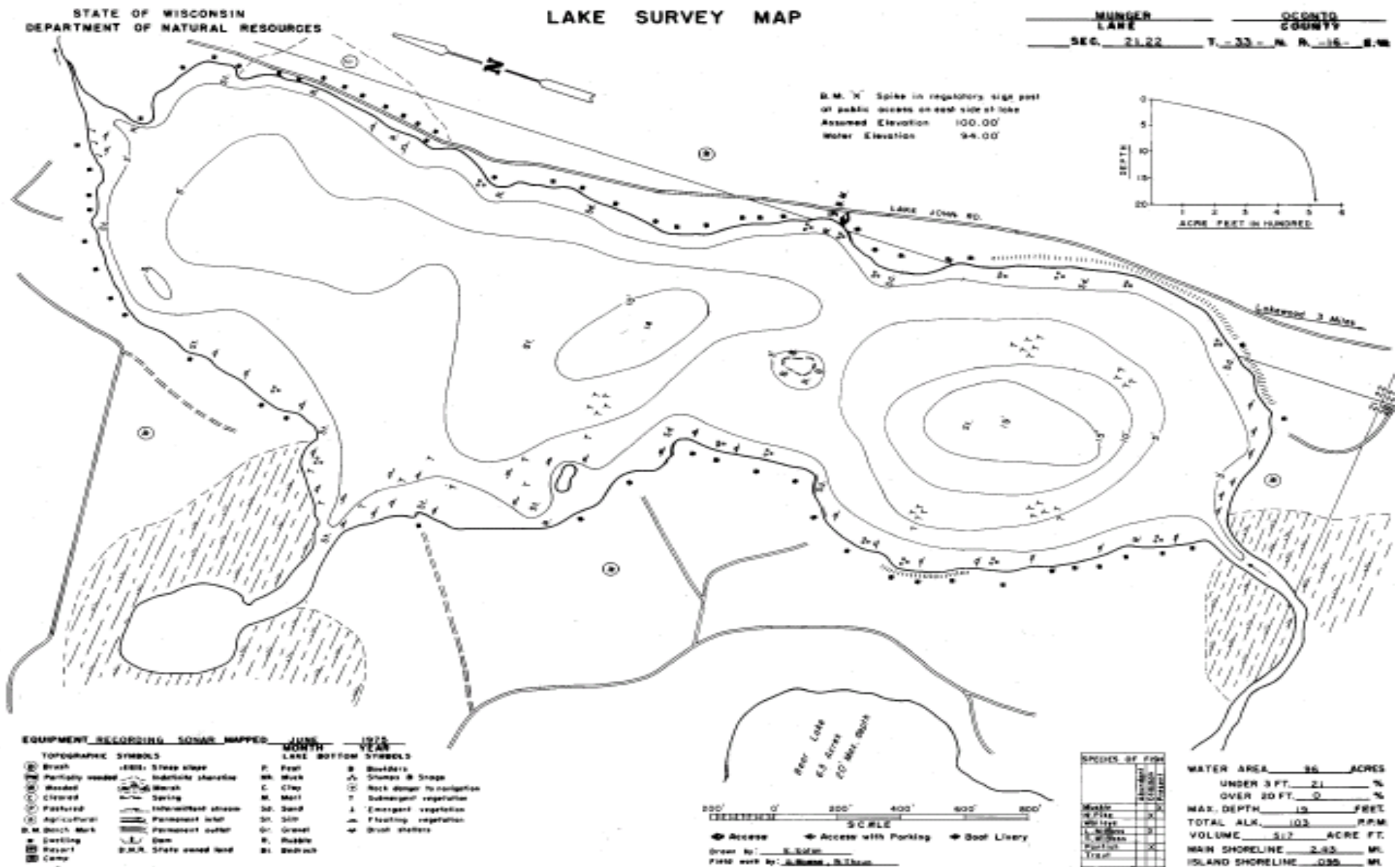


Figure 2. Map of Munger Lake, Oconto County, Wisconsin ( <http://dnr.wi.gov/lakes/maps/DNR/0470900a.pdf> ).

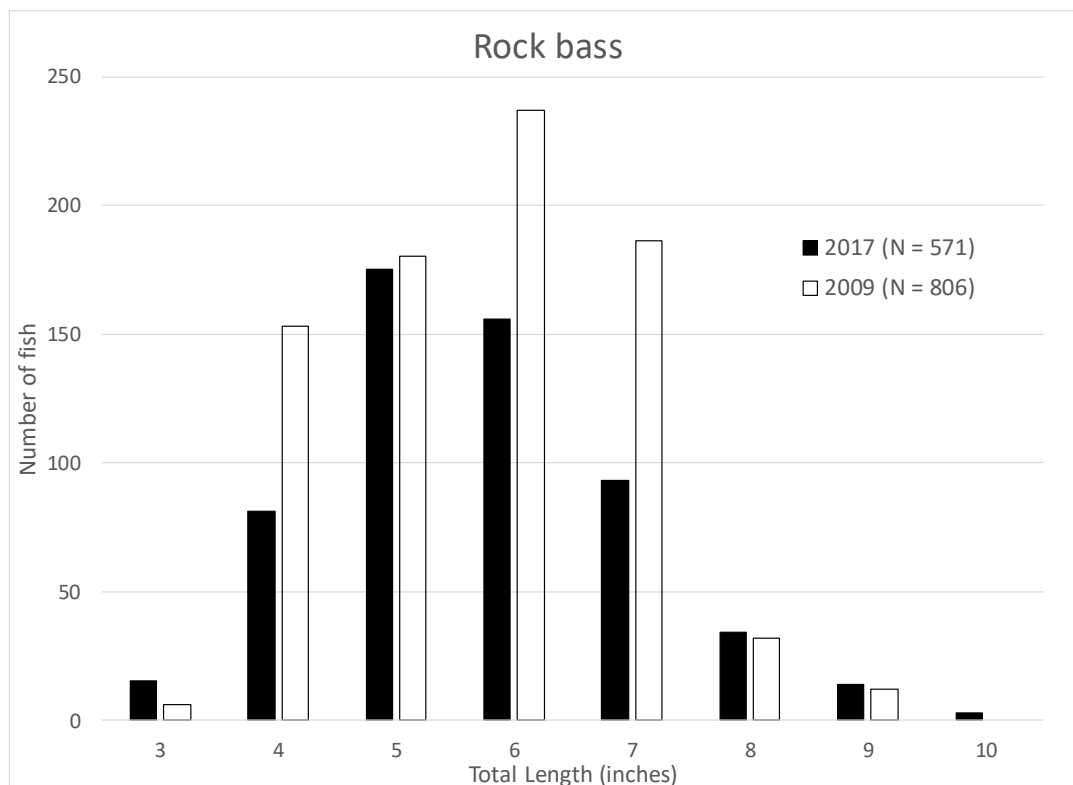


Figure 3. Length frequency of rock bass collected during fish surveys in 2009 and 2017 on Bear and Munger Lakes; Oconto County, WI.

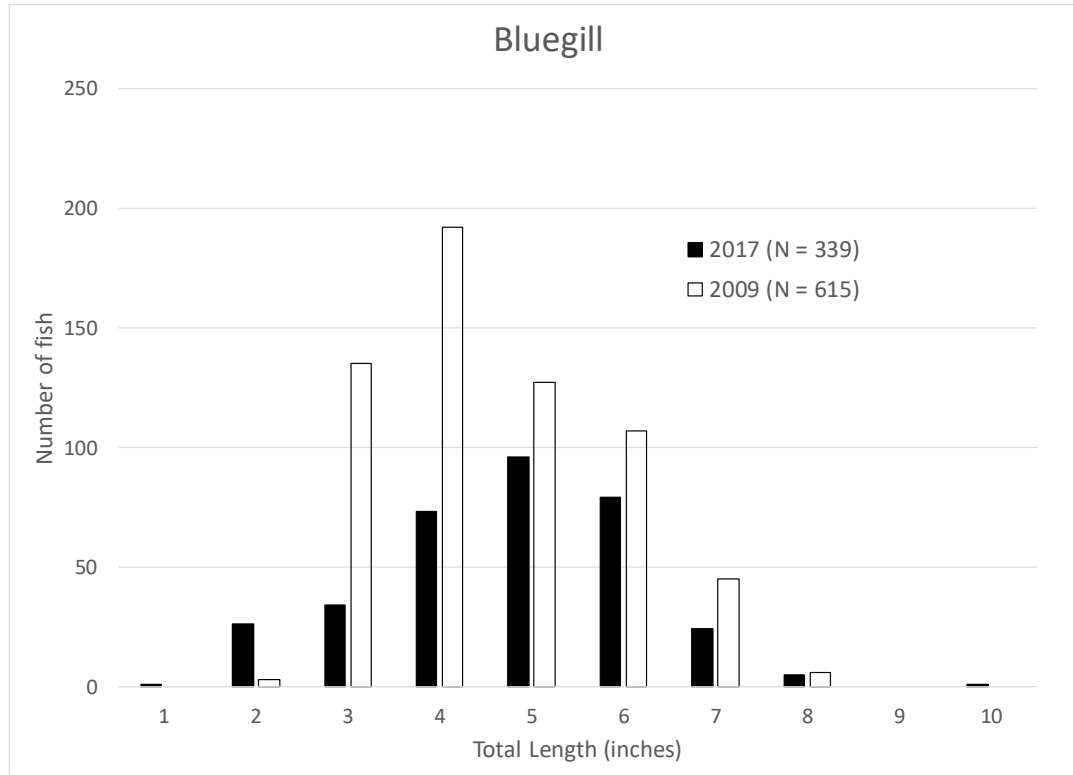


Figure 4. Length frequency of bluegill collected during fish surveys in 2009 and 2017 on Bear and Munger Lakes; Oconto County, WI.



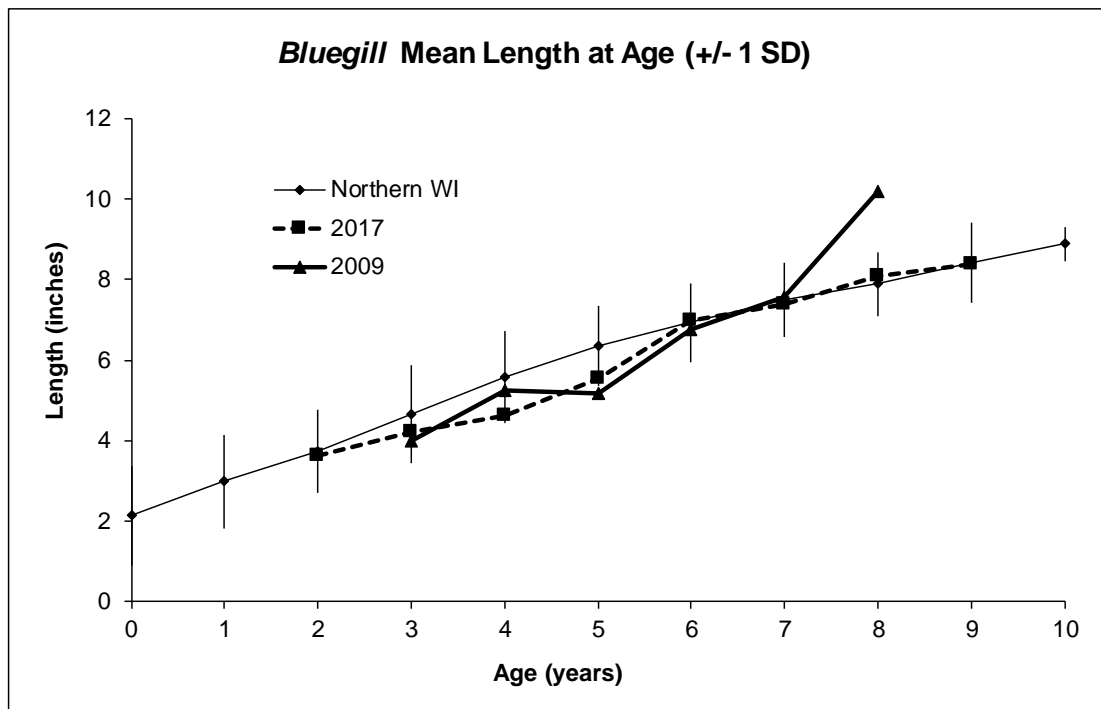


Figure 5. Bluegill mean length at age (+/- 1 SD); Bear and Munger Lakes; Oconto County, WI.

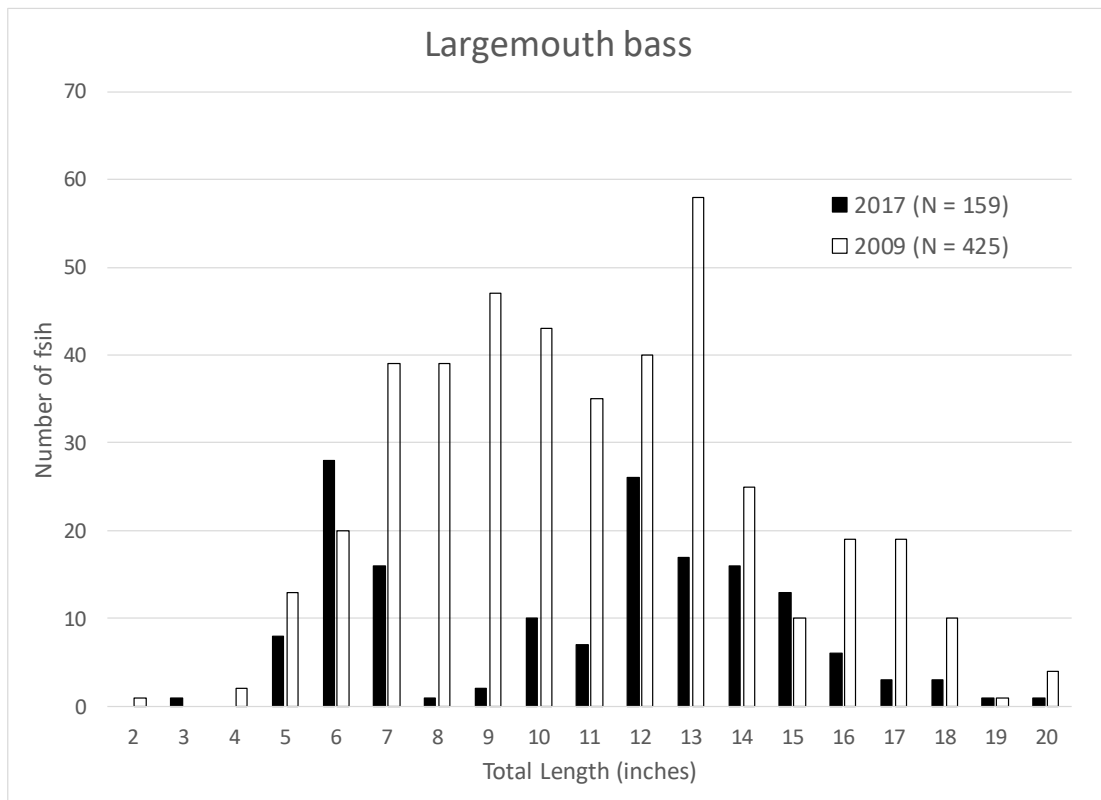


Figure 6. Length frequency of largemouth bass collected during fish surveys in 2009 and 2017 on Bear and Munger Lakes; Oconto County, WI.

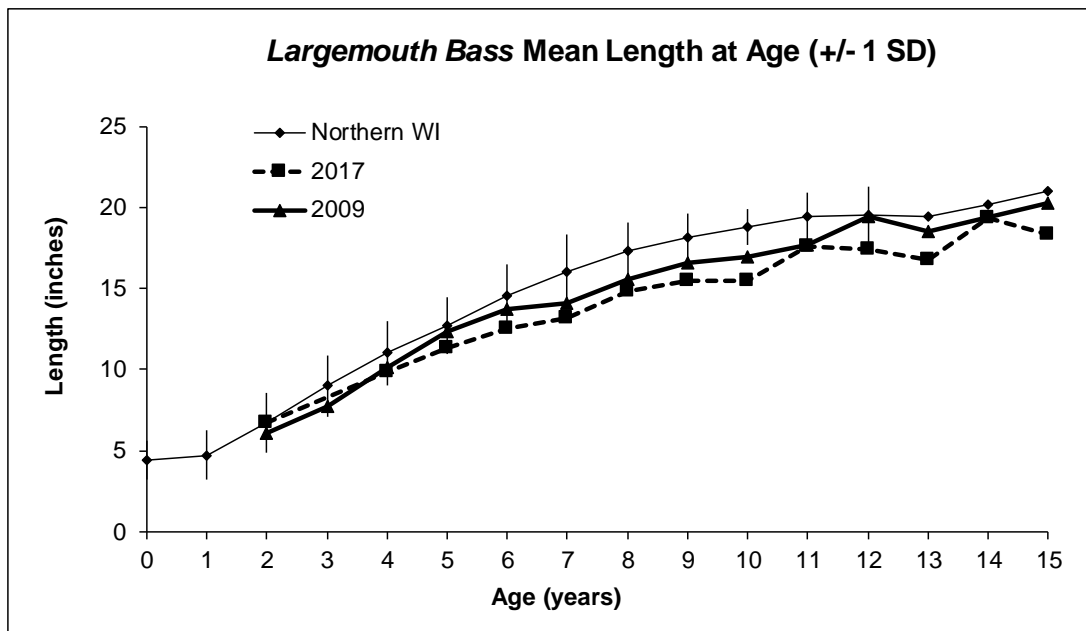


Figure 7. Largemouth bass mean length at age (+/- 1 SD); Bear and Munger Lakes; Oconto County, WI.

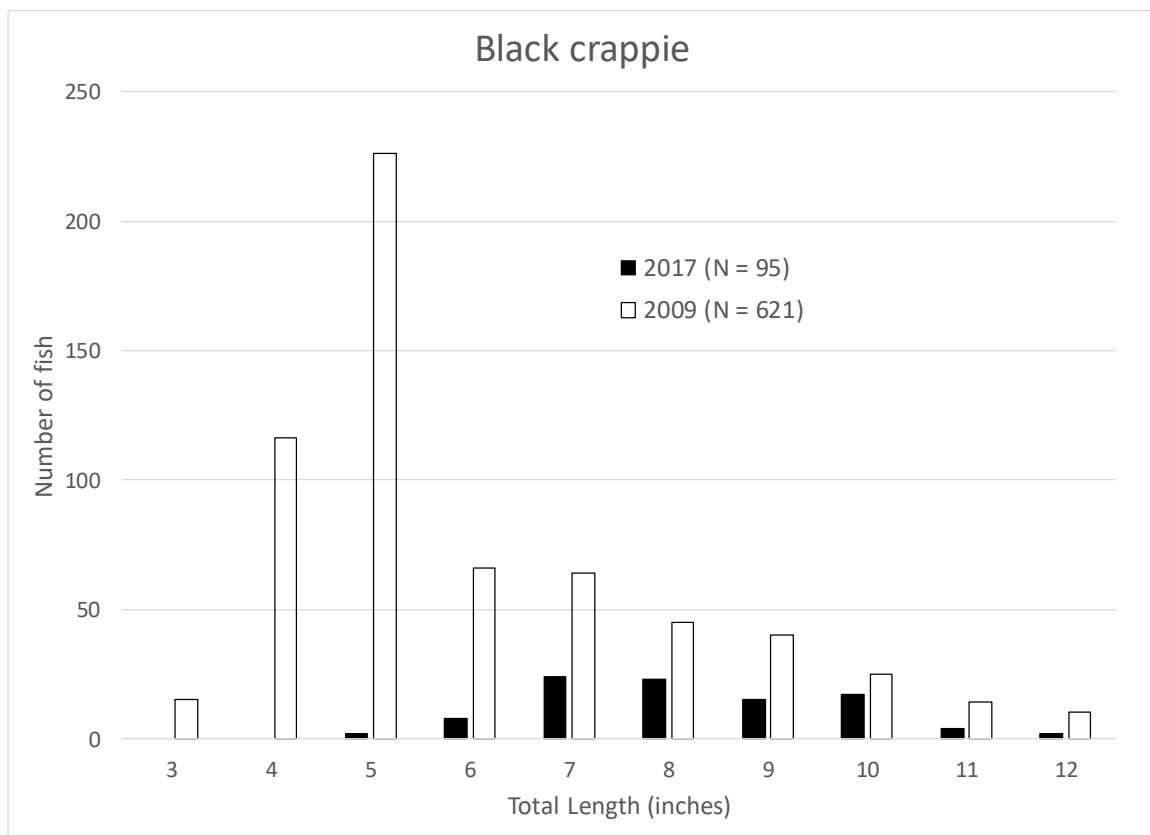


Figure 8. Length frequency of black crappie collected during fish surveys in 2009 and 2017 on Bear and Munger Lakes; Oconto County, WI.

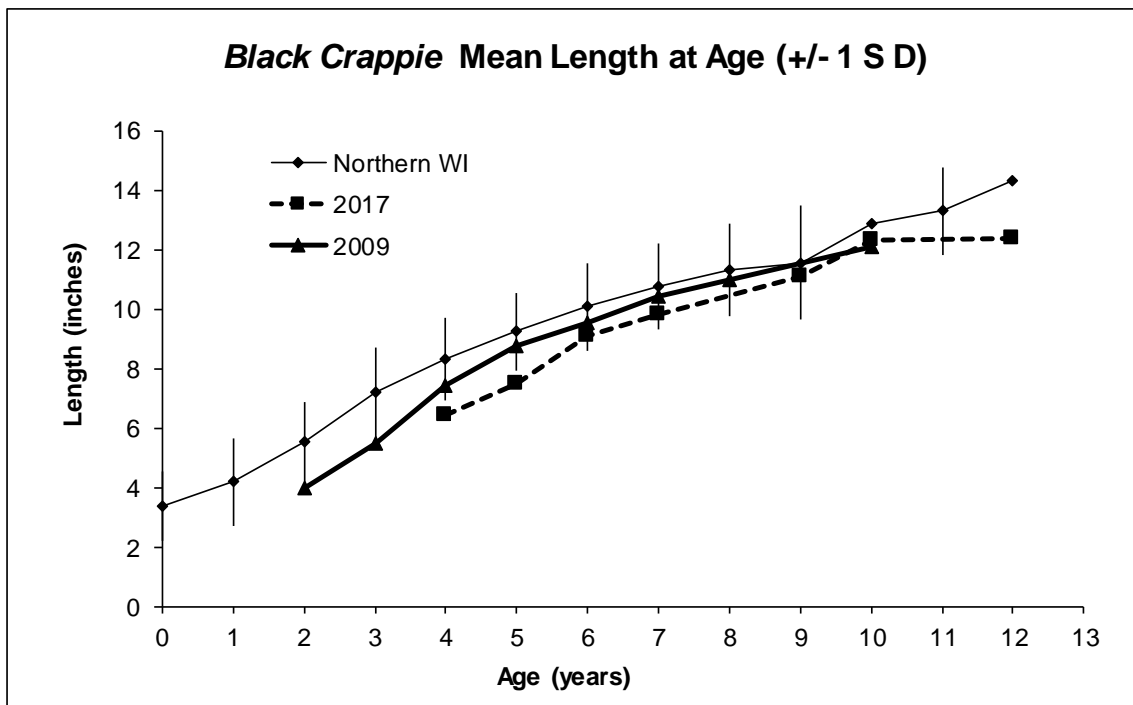


Figure 9. Black crappie mean length at age (+/- 1 SD); Bear and Munger Lakes; Oconto County, WI.

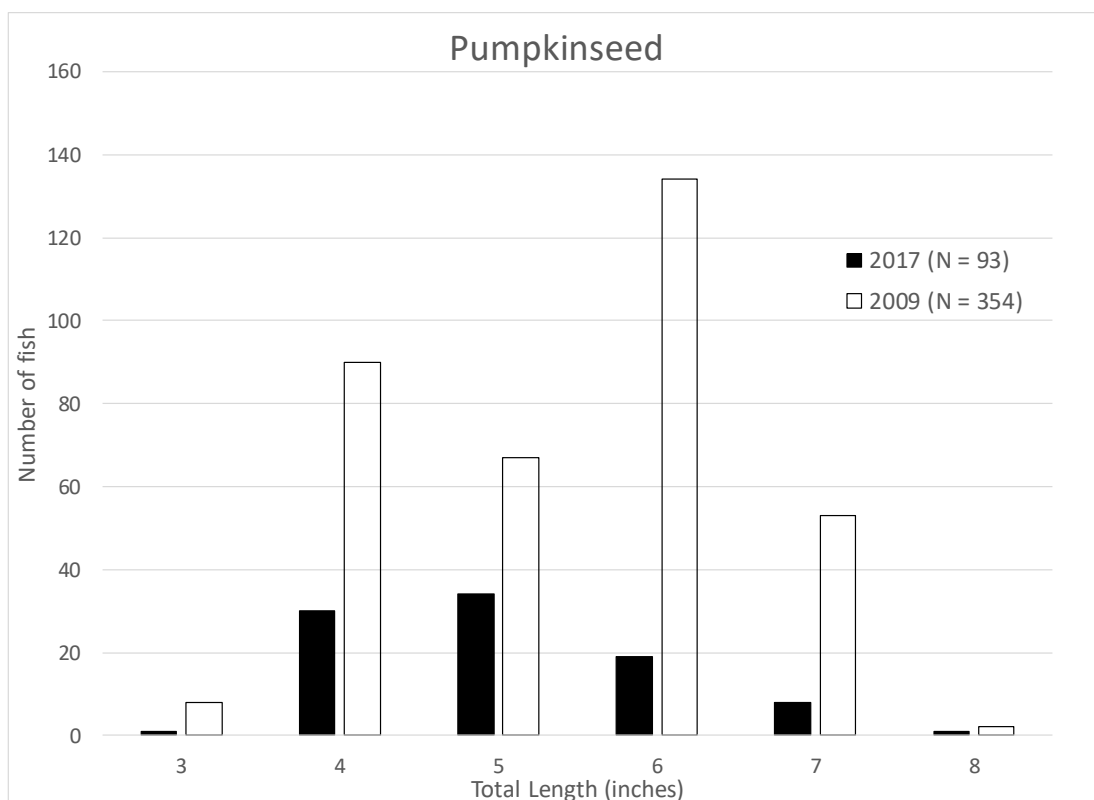


Figure 10. Length frequency of pumpkinseed collected during fish surveys in 2009 and 2017 on Bear and Munger Lakes; Oconto County, WI.

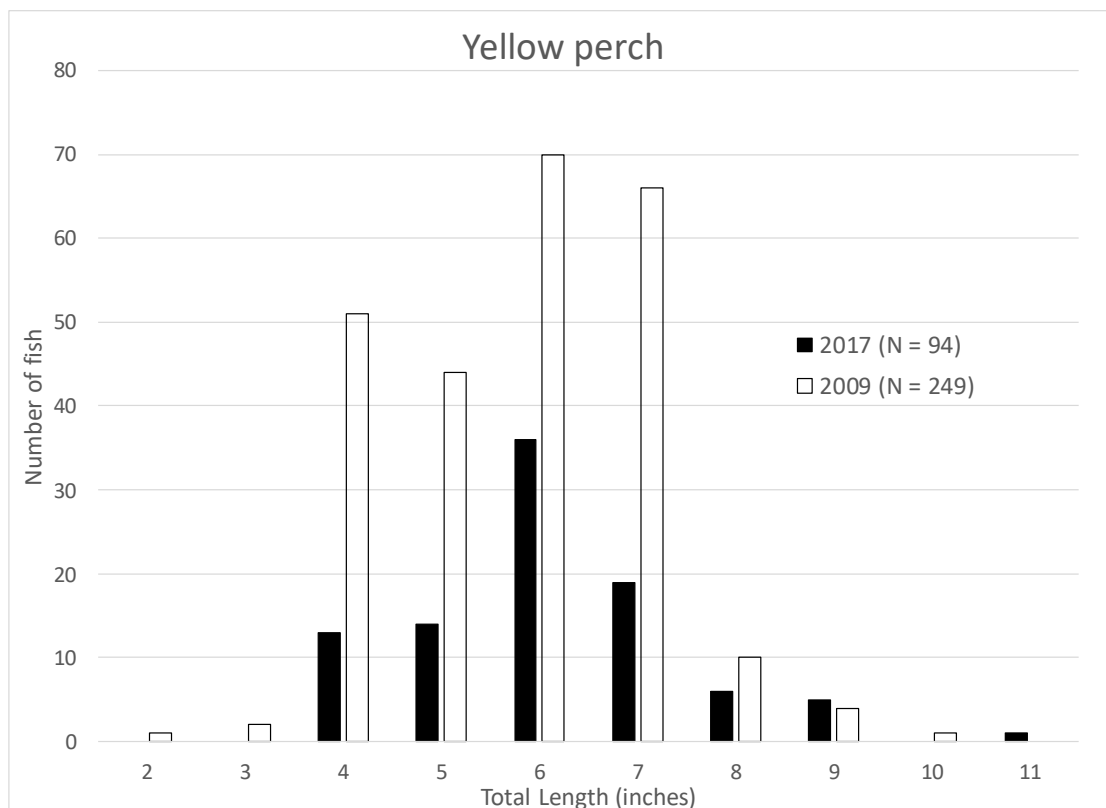


Figure 11. Length frequency of yellow perch collected during fish surveys in 2009 and 2017 on Bear and Munger Lakes; Oconto County, WI.

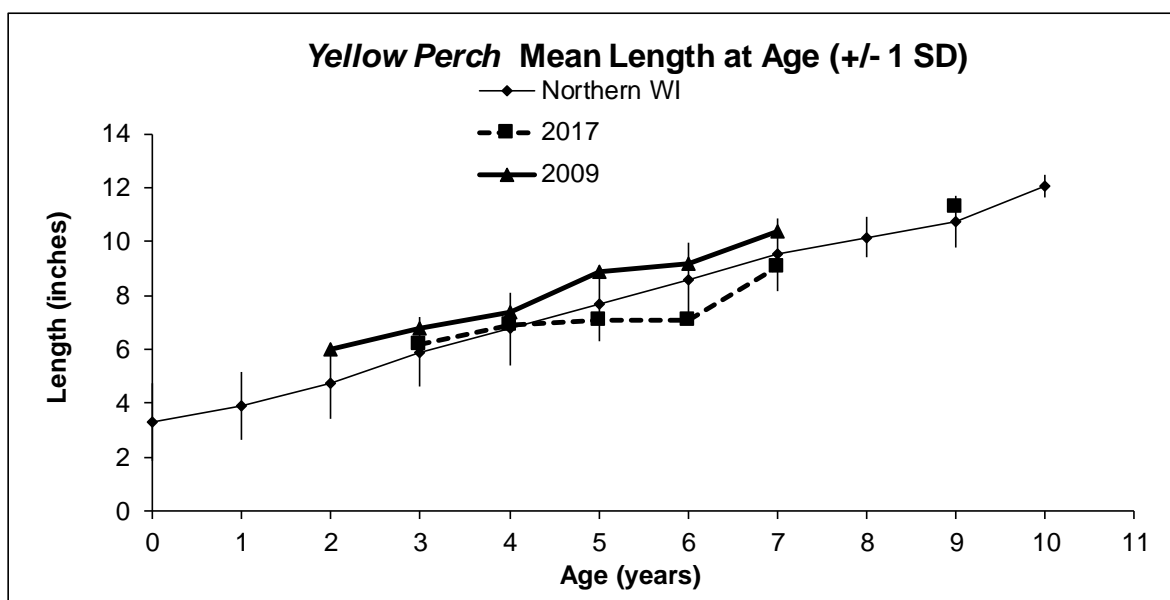


Figure 12. Yellow perch mean length at age (+/- 1 SD); Bear and Munger Lakes; Oconto County, WI.

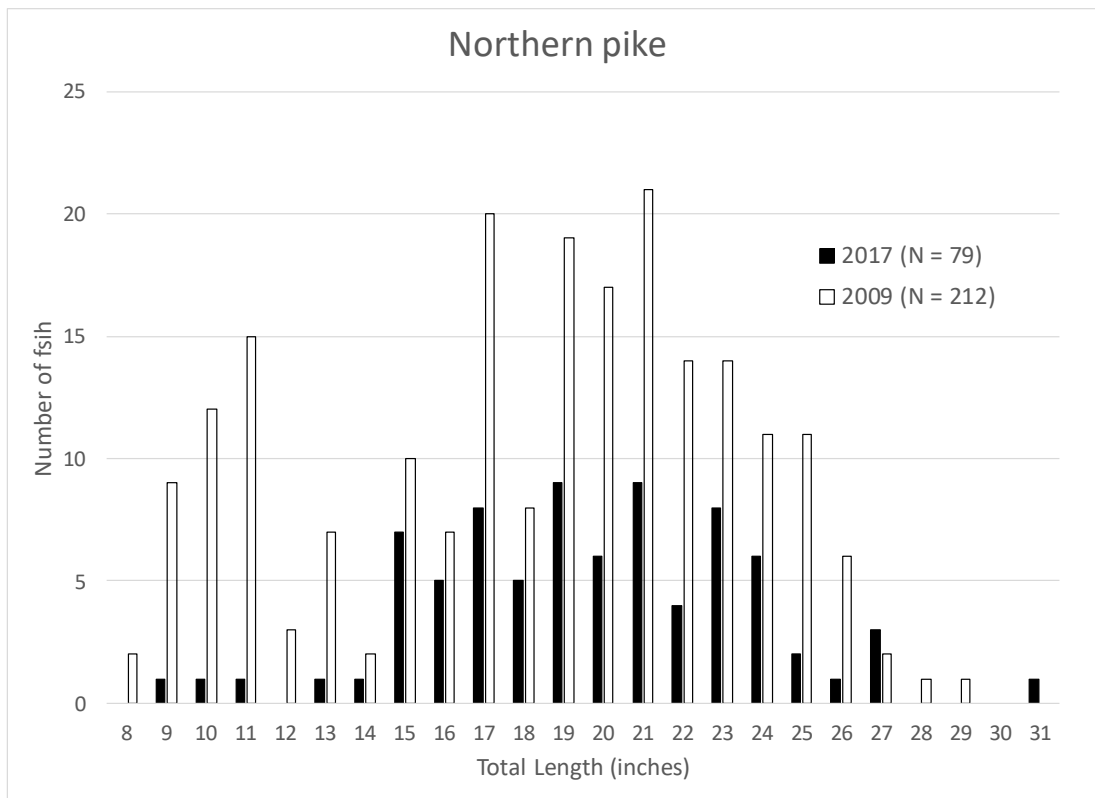


Figure 13. Length frequency of northern pike collected during fish surveys in 2009 and 2017 on Bear and Munger Lakes; Oconto County, WI.

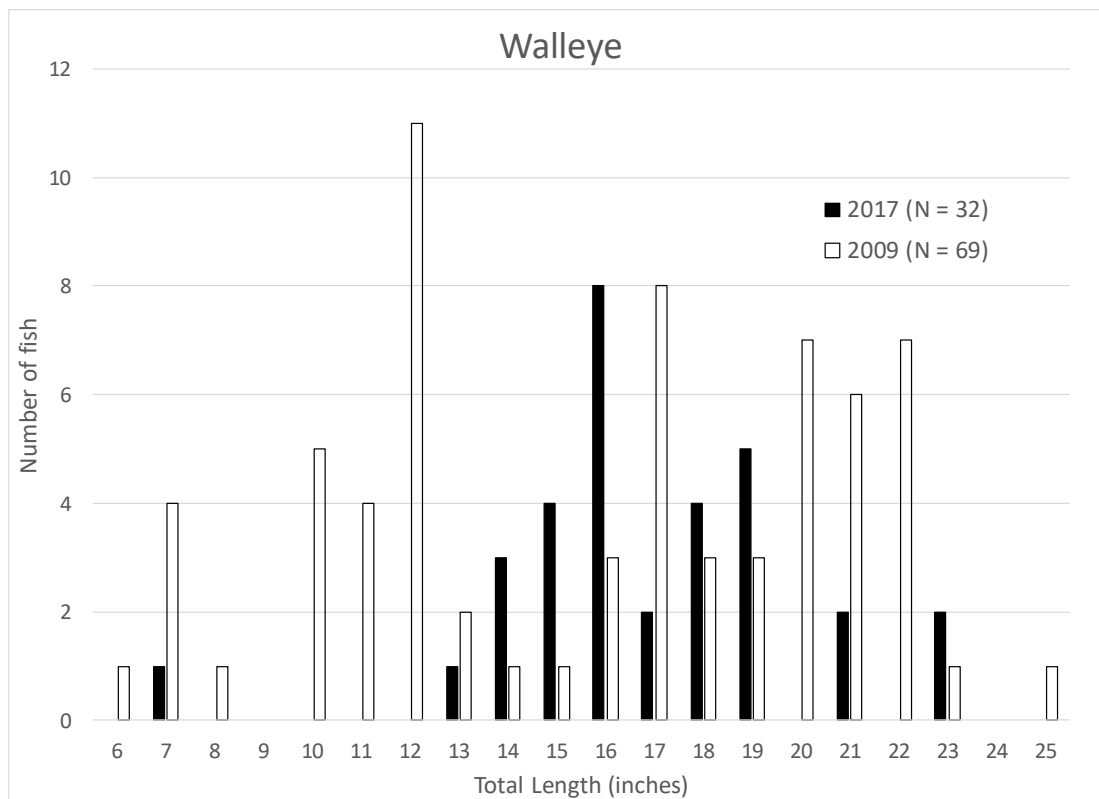


Figure 14. Length frequency of walleye collected during fish surveys in 2009 and 2017 on Bear and Munger Lakes; Oconto County, WI.

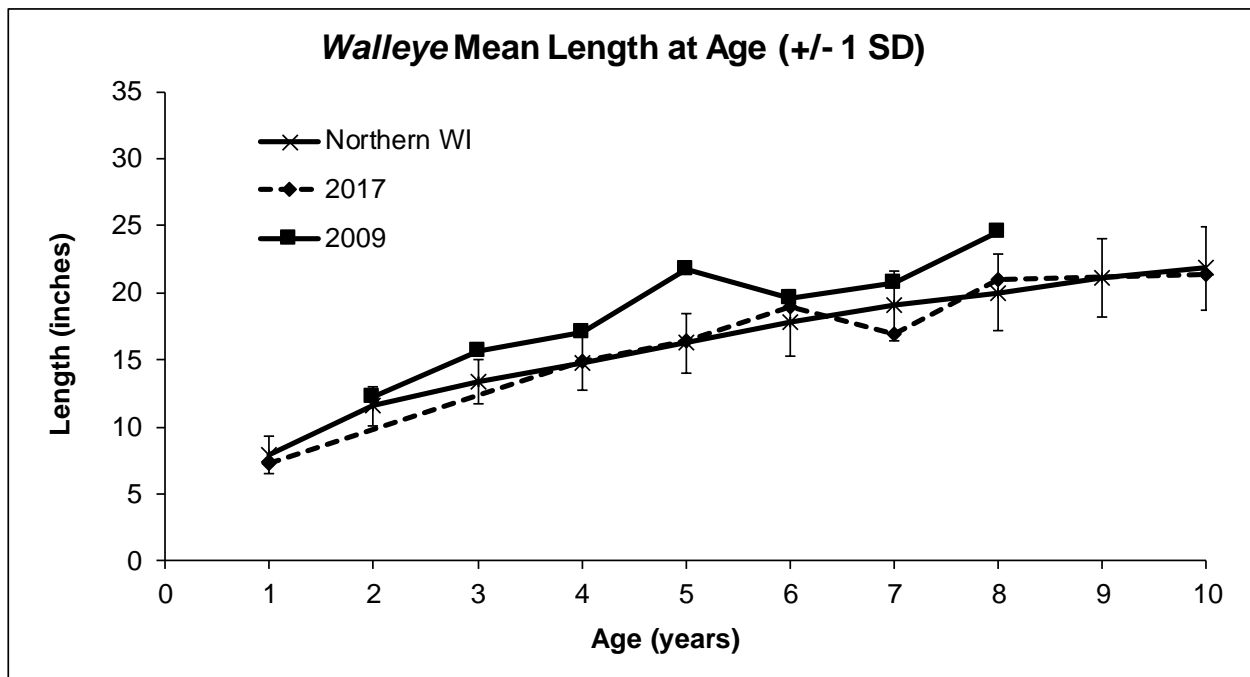


Figure 15. Walleye mean length at age (+/- 1 SD); Bear and Munger Lakes; Oconto County, WI.